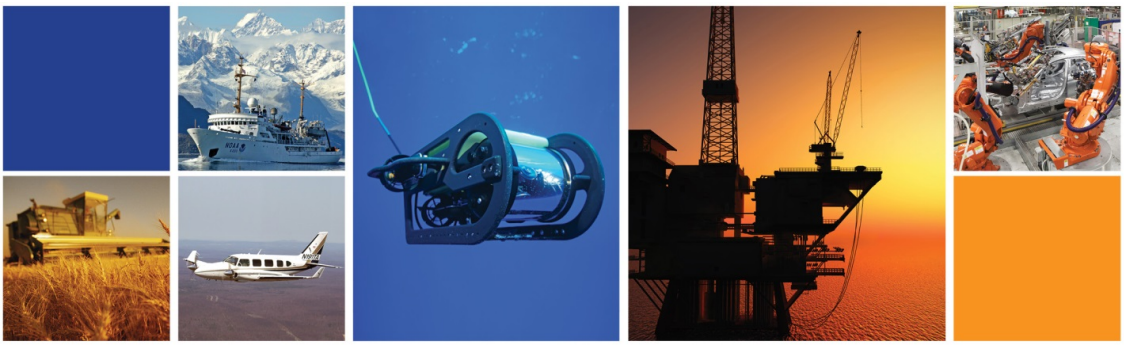
DMU10 (A Model) Evaluation Kit
User Manual

DMU10-00A-0100-910



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GLOSSARY

CD	Compact Disk
CD-ROM	CD-Read Only Memory
COM	Serial port interface
CSV	Comma Separated Variables
DMU	Dynamic Measurement Unit
FP	Floating Point
GND	Ground
IMU	Inertial Measurement Unit
kbit/s	kilobits per second
LPT	Parallel port interface
MB	Mega Bytes
ms	milliseconds
OEM	Original Equipment Manufacturer
PC	Personal Computer
PCB	Printed Circuit Board
RAM	Random Access Memory
Rx	Receive
SP	Service Pack
Tx	Transmit
USB	Universal Serial Bus
Vel	Velocity

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1 Introduction

The DMU10 is the latest six degree of freedom Dynamic Measurement Unit from Silicon Sensing Systems Ltd. The DMU10 has been designed to provide exceptional performance where size and cost are of the upmost priority.

The DMU10 Evaluation Kit, see Figure 1, enables the output data from the DMU10 to be viewed and logged for testing and evaluating purposes.

This kit is primarily for use with the DMU10 (A Model) build standard.

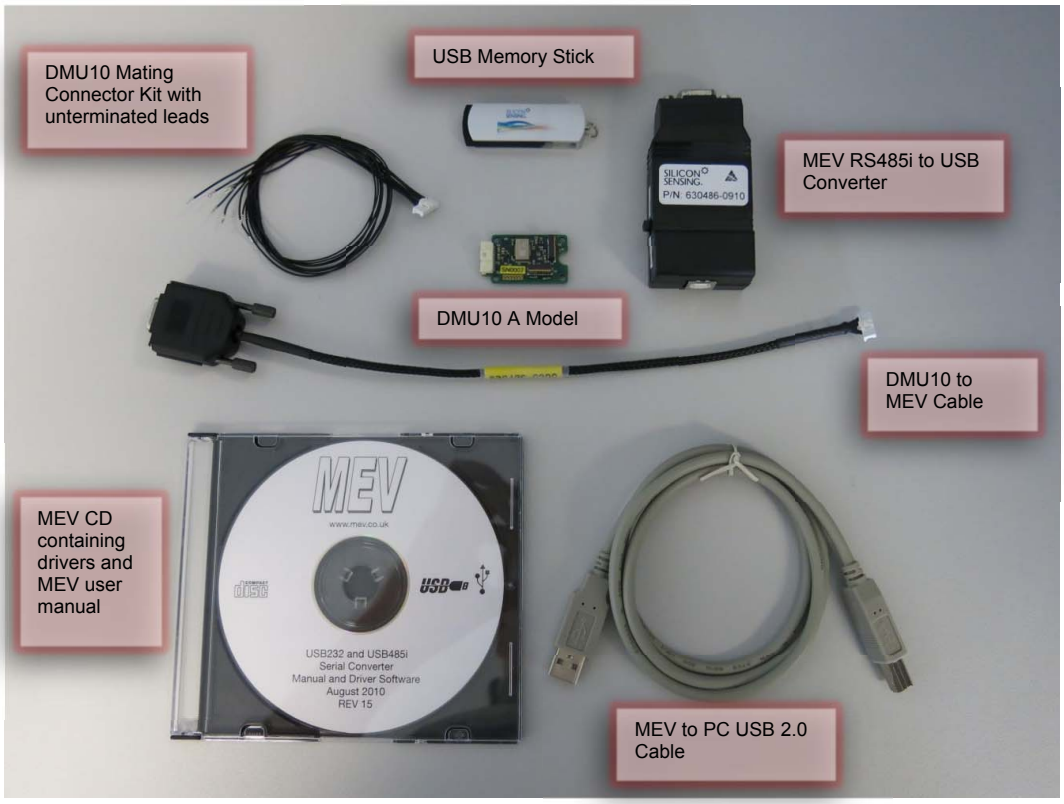
DMU10 Mating Connector Kit with unterminated leads
USB Memory Stick
MEV RS485i to USB Converter
DMU10 A Model
DMU10 to MEV Cable
MEV CD containing drivers and MEV user manual
MEV to PC USB 2.0 Cable
USB232 and USB485i
Serial Converter
Manual and Driver Software
August 2010
REV 15

Figure 1: DMU10 Evaluation Kit

2 System Requirements

The DMU10 Evaluation Kit requires a PC with a USB port. The requirements for the PC are as follows:

- Microsoft® Windows® XP (SP3 or greater), Vista® or Window 7 and Windows 8 Operating Systems. The software has not been tested on any other operating systems and therefore correct functionality cannot be guaranteed.
- Minimum of 500 Mb of RAM.
- 500 Mb of free hard drive space plus space for logged data (typical data rate ≈ 50 kbit/s).
- High power or self-powered USB 2.0 Port.

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3 Potential Restrictions and Issues

The USB interface on the PC can result in errors in the USB Message Stream introduced by interruptions by the operating system, resulting in possible loss of partial or complete messages. Such errors, if they occur, can be minimised by:

a) Minimising the number of other applications and software running on the PC.

b) Disconnecting the PC from a network or wireless connection.

c) Using very high speed PCs.

d) Disabling scheduled virus scans and Operating System updates.

e) Disabling all PC power saving options.

Any disruption to the message stream can be observed in the logged files using the message counter, checking for lost data.

4 Evaluation Kit Contents

The DMU10 evaluation kit (part number DMU10-21-0500) contains the following:

- DMU10 IMU A Model, (Part Number DMU10-21-0100)
- MEV RS485i to USB Converter, (Part Number 630486-0910)
- CD containing the MEV drivers
- USB memory stick (Part Number 630486-0920) containing the data logging software
- Interface Cables

4.1 DMU10 (A Model)

Figure 2 shows the Dynamic Measurement Unit used with the evaluation kit.

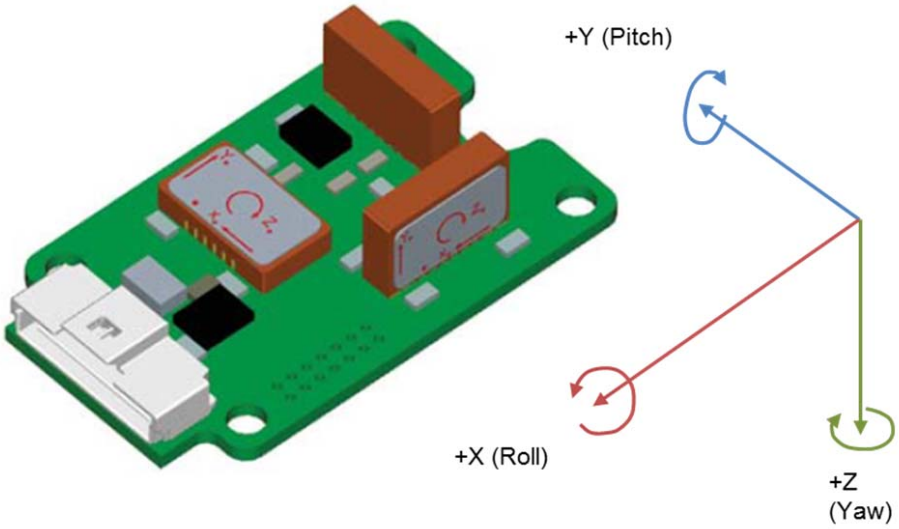

Figure 2: DMU10 (A Model)

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4.2 MEV RS485i to USB Converter and CD

The RS485i to USB Converter is manufactured by MEV. The standard MEV converter has been modified to route the 5 V USB Supply Voltage through to the DMU10, which allows the DMU10 and the Evaluation Kit to be powered from the USB.

There is an Enable/Disable switch on the MEV, see Figure 3, which can be used to control the output from the DMU10.

- **Enable**: The DMU10 output is enabled and data will be transmitted on the RS422 line.
- **Disable**: The DMU10 output is inhibited.

Figure 3: Enable / Disable Switch Location

If the Enable/Disable switch is changed to **Disable** while the message is being transmitted, the message is completed before the output is disabled.

If the Enable/Disable switch is changed to **Enable**, the complete message will be started at the next scheduled cycle.

The drivers and user manual for the MEV are included on the MEV CD.

4.3 USB Memory Stick

The USB Memory Stick contains the following:

- Data Logging Software – 1-10670-020-430 Rev 2
- This User Manual
- DMU10 Brochure

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4.4 Interface Cables

Three cables are included in the kit:

1. DMU10 to MEV Cable (Part Number 630486-0900)
2. MEV to PC USB 2.0 Cable.
3. DMU10 Mating Connector kit with unterminated leads

The DMU10 Mating Connector kit enables the user to connect the DMU10 to alternative logging equipment and power supply.

5 Getting Started

5.1 Installation Overview

The software installation program uses the 'ClickOnce' installation format and can therefore be installed onto a PC without administrator rights. However, administrator rights are required whenever the application connects to an individual MEV device for the first time. This is because the application needs to change the MEV default driver settings, which are stored in the HKEY_LOCAL_MACHINE area of the Windows registry. For subsequent connections to that MEV device, the application will not require administrator rights. The recommended installation sequence is therefore:

1. Obtain administrator rights on the PC.
2. Install the MEV driver, see section 5.2.
3. Install the software, see section 5.3.
4. The installation procedure automatically runs the application once the installation has completed and at this point you should connect to the installed MEV device using the **Connect** button.

5.2 Installing the MEV RS485i USB Serial Converter Device Driver

5.2.1 Installation Procedure

The MEV RS485i includes an installation CD containing a USB driver file. To install the driver, proceed as follows:

1. Ensure that you have administrator rights on the PC.
2. Run <CD ROM Drive letter>:\Drivers\Win XP, Vista, 7, 8, 2003-2012\CDM20828_Setup.exe. This will install the required drivers into the Windows System folder.

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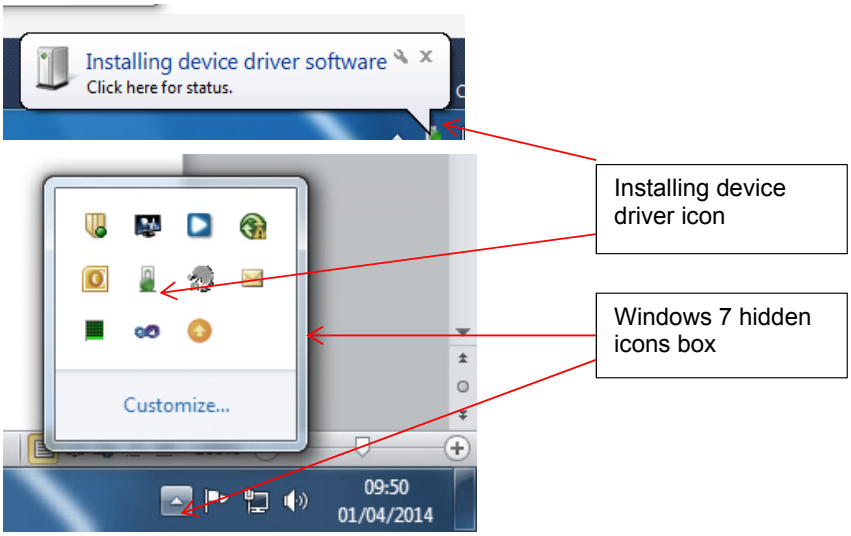
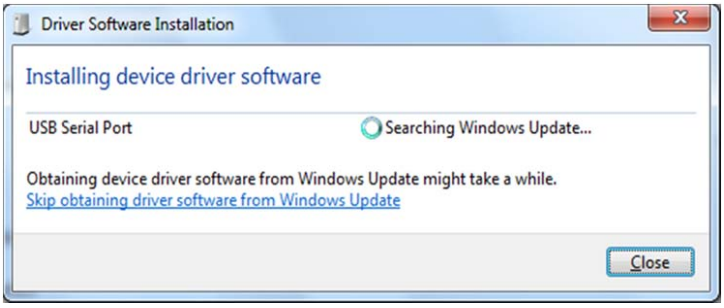
3. Plug the MEV RS485i device into a USB port and when the dialog below appears, be ready to click it or, if it disappears, click the animated icon that it is attached to. Note that in Windows 7, this icon can disappear into the hidden icon box when the dialog disappears.

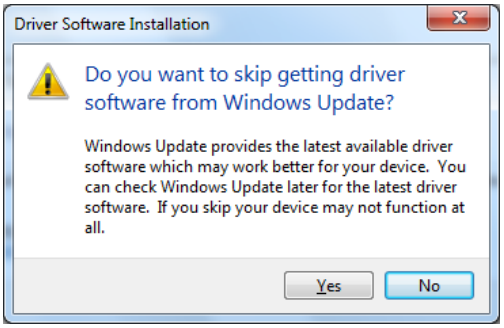


4. When the dialog shown below appears, click **Skip obtaining driver software from Windows Update**.

   If the PC has an internet connection, you can wait for the latest driver to be found via Windows Update. In which case you can skip to step 7 of this procedure. Note however that if a newer driver version is loaded, the software may not have been tested with this driver version.


Driver Software Installation
Installing device driver software
USB Serial Port
Searching Windows Update...
Obtaining device driver software from Windows Update might take a while.
Skip obtaining driver software from Windows Update
Close

5. Click **Yes** when the following dialog appears:


Driver Software Installation
Do you want to skip getting driver software from Windows Update?
Windows Update provides the latest available driver software which may work better for your device. You can check Windows Update later for the latest driver software. If you skip your device may not function at all.
Yes
No

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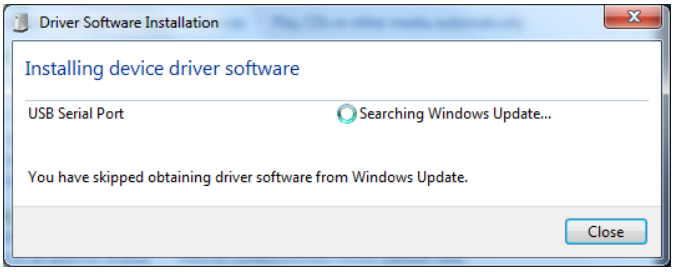
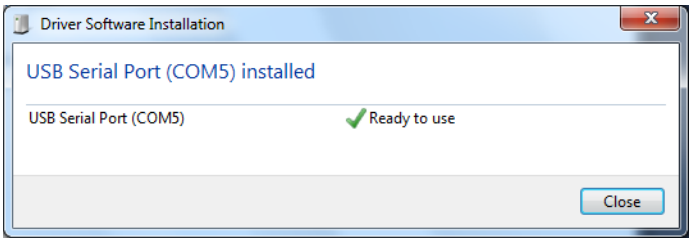
6. The following dialog should then appear and you must wait (do not click **Close** because the installation program has not completed yet):



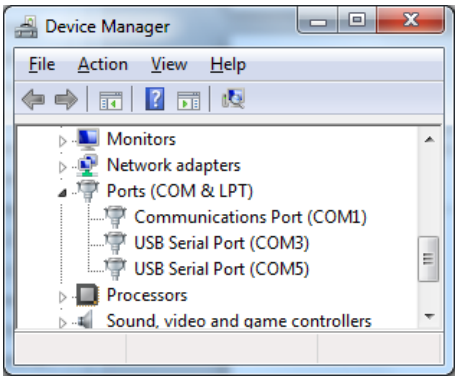
7. The installation program should then locate the previously installed drivers and you should eventually see the following dialog:



8. Click **Close** on the above dialog.

5.2.2 MEV Installation Troubleshooting

Correctly installed MEV devices should appear in the Windows Device Manager as USB virtual COM ports. These devices will disappear when the USB cable is removed but should re-appear when it is re-inserted. These same COM ports will appear in the DMU10 Utility serial port drop down list, enabling the application to connect to different MEV devices.



Note that each MEV device appears as a separate COM port and you will need to repeat steps 3 to 8 of the installation procedure for each MEV device plugged into the PC. If a MEV device appears under the **Other devices** heading of **Device Manager** instead of the **Ports (COM & LPT)** heading, then the device is in the process of being installed and you should not unplug it (look for the **Installing Driver** icon in the lower icon bar and follow steps 3 to 8 of the installation procedure).

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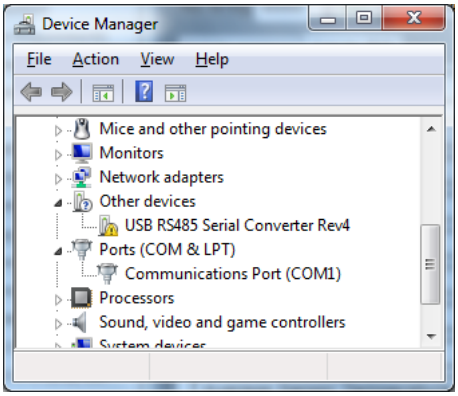
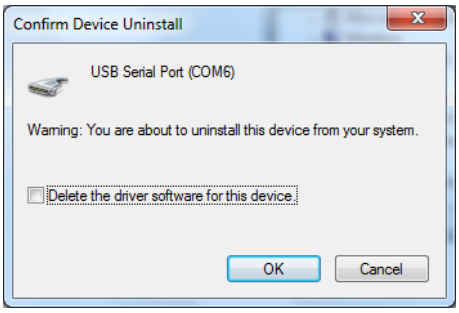


If you encounter problems connecting to a MEV device using the application's **Connect** button, it is possible that the installation failed. You can repeat an installation by right clicking on the device under the **Ports (COM & LPT)** heading and selecting the **Uninstall** option. When the dialog below appears, click **OK**. You must then unplug the USB cable and then plug it back in to restart the installation procedure (steps 3 to 8) again.


Confirm Device Uninstall
USB Serial Port (COM6)
Warning: You are about to uninstall this device from your system.
Delete the driver software for this device.
OK
Cancel

If the MEV is not detected when the USB cable is plugged into the PC, refer to the MEV USB232/485 Instruction Manual included on the CD within the DMU10 Evaluation Kit. Additional information may be also available on the MEV website at http://www.mev.co.uk

5.3 Installing the Data Logging Software

The data logging software is included on the USB Memory Stick within the DMU10 Evaluation Kit.

This software should work on all supported versions of Windows including XP.

5.3.1 Installation Procedure

To install the software, proceed as follows:

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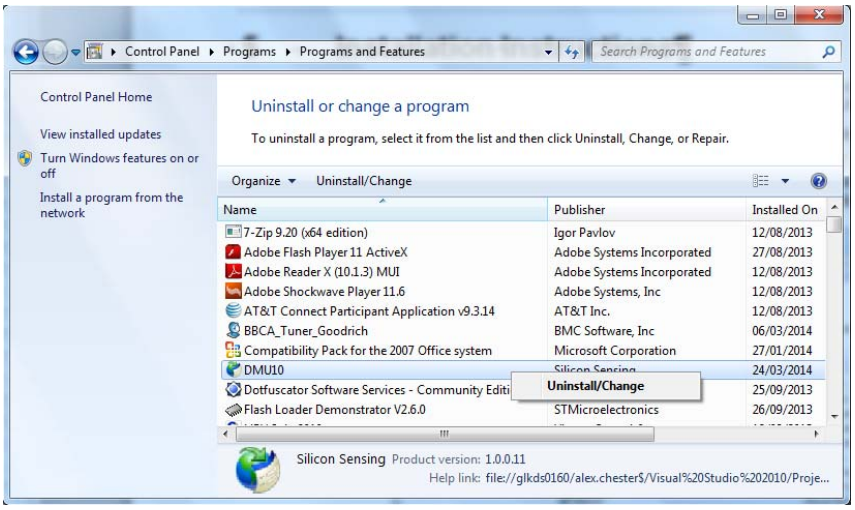
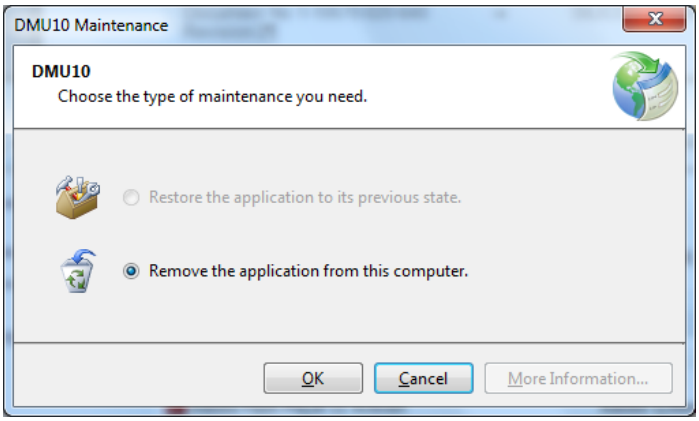
1. If a previous version of the Utility has been installed on the PC, you should un-install it first to prevent two different versions appearing. To do this select **Control Panel | Programs | Uninstall a program** to open the **Uninstall or change a program** dialog. Left click on the DMU10 program and select **Uninstall/Change**.

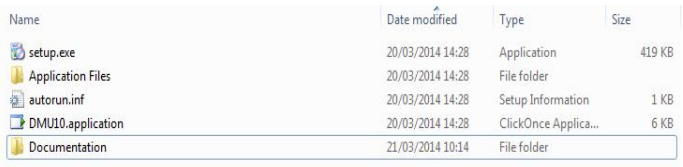


2. Click **OK** to remove the application from the PC.



3. If you have not already installed the MEV device driver, you should do this now (see section 5.2), and then ensure that the MEV device is plugged into a USB port on the PC.

4. Insert the USB Memory Stick into a USB Port on your PC. Once the memory stick is detected, you should see the following files:



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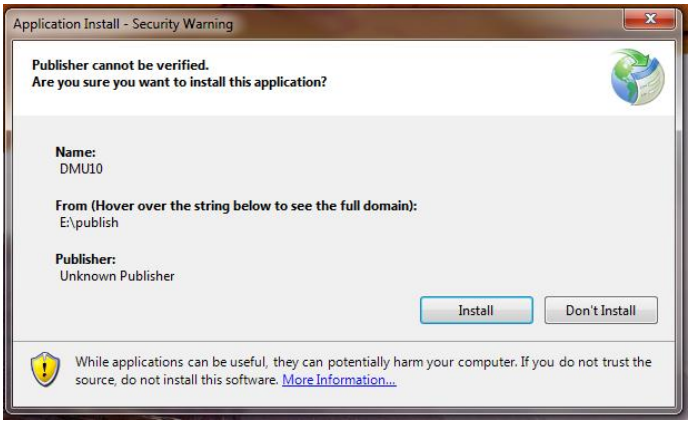
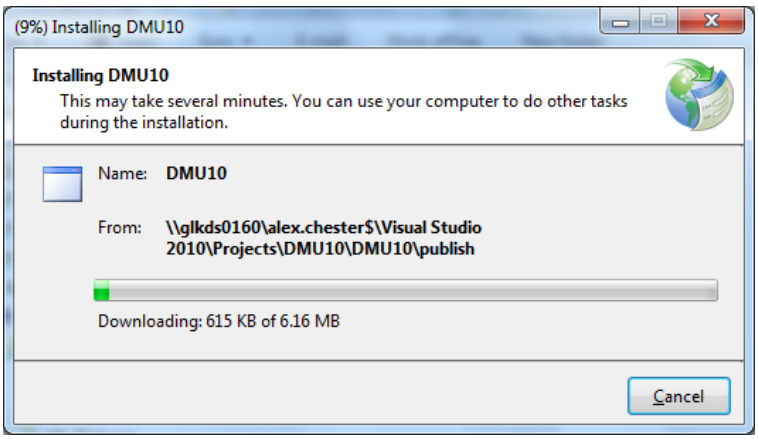
5. Run the Setup.exe program.

   Depending on how administrator rights are managed on some installations, you may need to select Setup.exe in its folder (it must be highlighted) and then right click and select the **Run as administrator** option in order to ensure that the installation is run with administrator rights.

   You may see the following message displayed because the software is proprietary to Silicon Sensing Systems Ltd and has not been registered with Microsoft.


Application Install - Security Warning
Publisher cannot be verified.
Are you sure you want to install this application?
Name:
DMU10
From (Hover over the string below to see the full domain):
E:\publish
Publisher:
Unknown Publisher
Install
Don't Install
While applications can be useful, they can potentially harm your computer. If you do not trust the source, do not install this software. More Information...

6. Click **Install** to install the data logging software.
7. The installation should then proceed with the following dialog:


(9%) Installing DMU10
Installing DMU10
This may take several minutes. You can use your computer to do other tasks during the installation.
Name: DMU10
From: \\glkds0160\alex.chester$\Visual Studio 2010\Projects\DMU10\DMU10\publish
Downloading: 615 KB of 6.16 MB
Cancel

   Note that this dialog may may be missed because it only appears very briefly on fast PCs. The software will install at the following location:

   Start | All Programs | Silicon Sensing

8. When the installation has completed, the application will be started by the install program. You should then ensure that a USB Serial Port is selected and then click the **Connect** button. This will write the required MEV driver settings to the Windows Registry. If you intend to use other MEV devices and do not normally have administrator rights on the PC, you should plug all the MEV devices into the PC now and repeat the connection process to ensure that each device has the correct settings written to the Windows Registry file.

   The software installation process is now complete.

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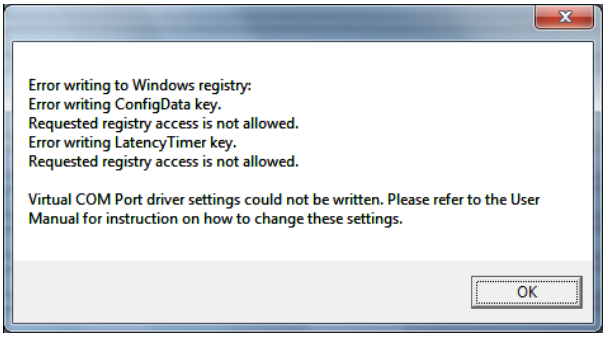
5.3.2 Installation Troubleshooting

If the installation program was run without administrator rights, the application will be unable to write the required settings to the registry when the **Connect** button is pressed and the dialog below will appear. If this occurs, you should first attempt to uninstall the application and then re-install it (with administrator rights). If you are unable, for any reason, to install the application with administrator rights, then the settings must be changed manually by following the procedure in section 5.4.6. Note however that changing these settings will also require administrator rights.


Error writing to Windows registry:
Error writing ConfigData key.
Requested registry access is not allowed.
Error writing LatencyTimer key.
Requested registry access is not allowed.
Virtual COM Port driver settings could not be written. Please refer to the User Manual for instruction on how to change these settings.
OK

5.4 Using the Software

5.4.1 Starting the Application

Go to **Start** | **All Programs | Silicon Sensing** and select **DMU10** to launch the application.

Note: In Windows 8, the installation will create a DMU10 icon in the **Start** menu.

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5.4.2 Main Window

The application's main window is shown in Figure 4.

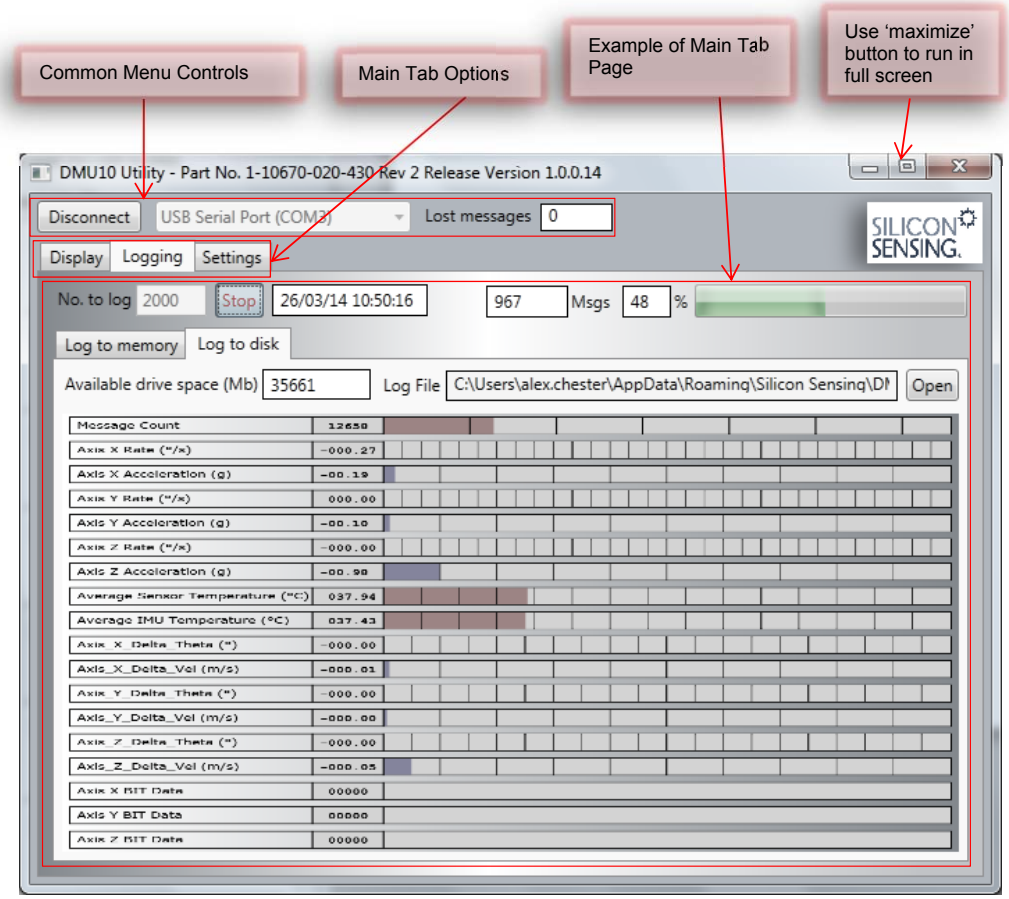

Figure 4: Software Application Main Window

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5.4.2.1 Common Controls

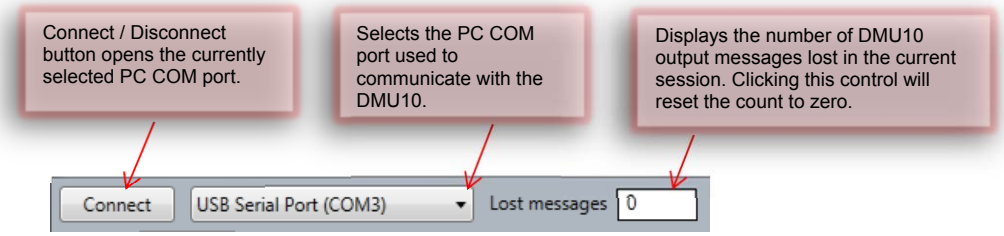
Connect / Disconnect button opens the currently selected PC COM port.
Selects the PC COM port used to communicate with the DMU10.
Displays the number of DMU10 output messages lost in the current session. Clicking this control will reset the count to zero.
Connect
USB Serial Port (COM3)
Lost messages
0

Figure 5: Main Controls

Common controls always remain visible and are used by all Tab pages. These controls have tool tips (help text will appear when you hover the mouse cursor over an enabled control).

5.4.2.2 Main Tab Options

There are three main tab options:

- Display
- Logging
- Settings

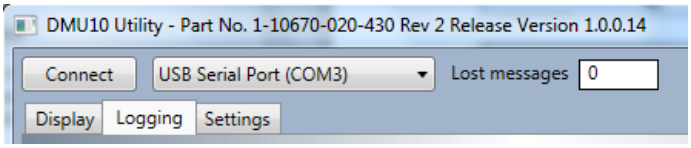

Figure 6: Main Tab Options

The following sections describe each tab in detail.

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5.4.3 Display Tab

The **Display** tab shows the DMU10 output data in real-time using level meters.

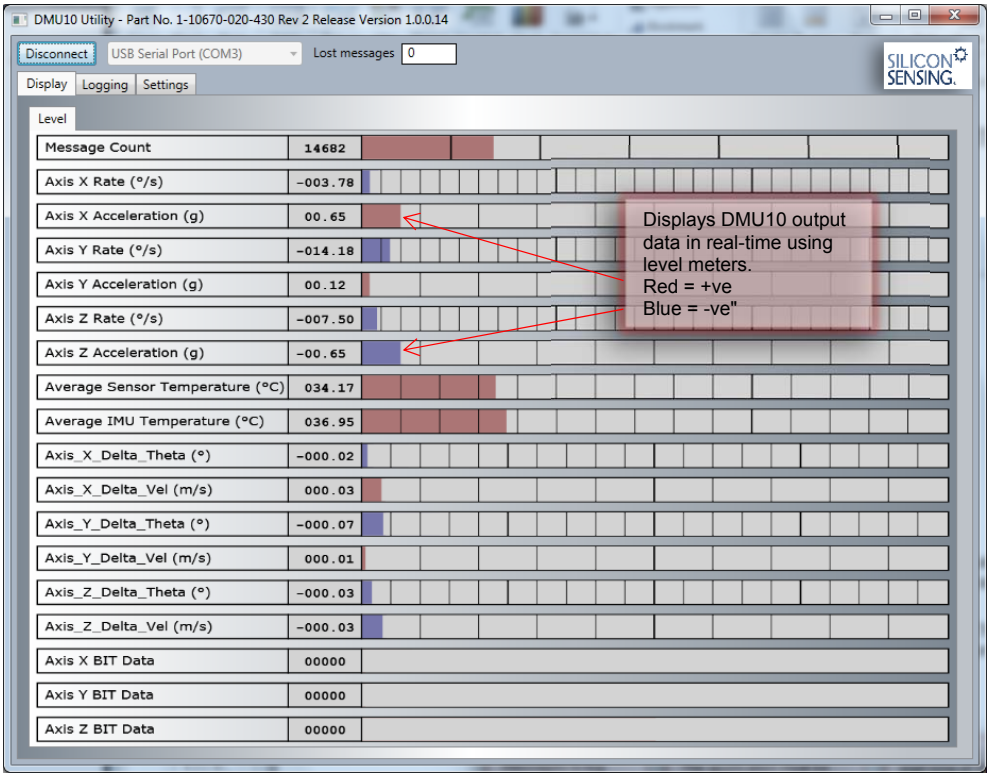

Figure 7: Real-time Display Page

5.4.4 Logging Tab

The **Logging** tab enables the DMU10 data output to be logged for evaluation purposes.

For data logging, you must first connect the application to a MEV USB Serial Port as described in section 5.4.2.1.

The Logging tab contains two tabs:

- Log to memory
- Log to disk

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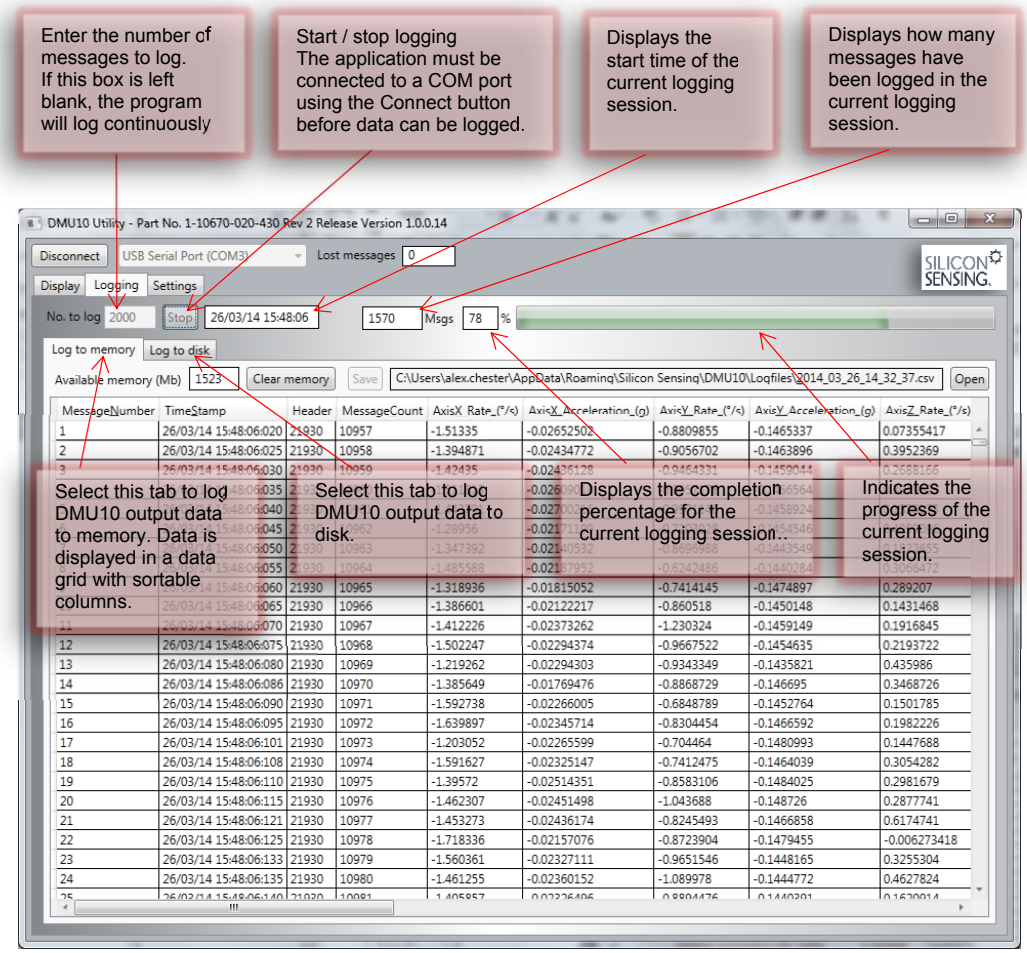
Enter the number of messages to log. If this box is left blank, the program will log continuously
Start / stop logging The application must be connected to a COM port using the Connect button before data can be logged.
Displays the start time of the current logging session.
Displays how many messages have been logged in the current logging session.
DMU10 Utility - Part No. 1-10670-020-430 Rev 2 Release Version 1.0.0.14
Disconnect
USB Serial Port (COM3)
Lost messages
Display
Logging
Settings
No. to log
2000
Stop
26/03/14 15:48:06
1570
Msgs
78
%
Log to memory
Log to disk
Available memory (Mb)
1523
Clear memory
Save
C:\Users\alex.chester\AppData\Roaming\Silicon Sensing\DMU10\Logfiles\2014_03_26_14_32_37.csv
Open
Select this tab to log DMU10 output data to memory. Data is displayed in a data grid with sortable columns.
Select this tab to log DMU10 output data to disk.
Displays the completion percentage for the current logging session..
Indicates the progress of the current logging session.

MessageNumber	TimeStamp	Header	MessageCount	AxisX_Rate_(°/s)	AxisX_Acceleration_(g)	AxisY_Rate_(°/s)	AxisY_Acceleration_(g)	AxisZ_Rate_(°/s)
1	26/03/14 15:48:06:020	21930	10957	-1.51335	-0.02652502	-0.8809855	-0.1465337	0.07355417
2	26/03/14 15:48:06:025	21930	10958	-1.394871	-0.02434772	-0.9056702	-0.1463896	0.3952369
11	26/03/14 15:48:06:070	21930	10967	-1.412226	-0.02373262	-1.230324	-0.1459149	0.1916845
12	26/03/14 15:48:06:075	21930	10968	-1.502247	-0.02294374	-0.9667522	-0.1454635	0.2193722
13	26/03/14 15:48:06:080	21930	10969	-1.219262	-0.02294303	-0.9343349	-0.1435821	0.435986
14	26/03/14 15:48:06:086	21930	10970	-1.385649	-0.01769476	-0.8868729	-0.146695	0.3468726
15	26/03/14 15:48:06:090	21930	10971	-1.592738	-0.02266005	-0.6848789	-0.1452764	0.1501785
16	26/03/14 15:48:06:095	21930	10972	-1.639897	-0.02345714	-0.8304454	-0.1466592	0.1982226
17	26/03/14 15:48:06:101	21930	10973	-1.203052	-0.02265599	-0.704464	-0.1480993	0.1447688
18	26/03/14 15:48:06:108	21930	10974	-1.591627	-0.02325147	-0.7412475	-0.1464039	0.3054282
19	26/03/14 15:48:06:110	21930	10975	-1.39572	-0.02514351	-0.8583106	-0.1484025	0.2981679
20	26/03/14 15:48:06:115	21930	10976	-1.462307	-0.02451498	-1.043688	-0.148726	0.2877741
21	26/03/14 15:48:06:121	21930	10977	-1.453273	-0.02436174	-0.8245493	-0.1466858	0.6174741
22	26/03/14 15:48:06:125	21930	10978	-1.718336	-0.02157076	-0.8723904	-0.1479455	-0.006273418
23	26/03/14 15:48:06:133	21930	10979	-1.560361	-0.02327111	-0.9651546	-0.1448165	0.3255304
24	26/03/14 15:48:06:135	21930	10980	-1.461255	-0.02360152	-1.089978	-0.1444772	0.4627824

Figure 8: Logging Tab Overview

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5.4.4.1 Log File Format

The data is logged in a CSV format. This can be imported into an Excel spreadsheet or read using MATLAB® or other similar analysis tools. Table 1 shows the contents of the message stream sent from the DMU10 Evaluation Kit to the PC. When the File is imported into MS Excel, the Worksheet is formatted with in Columns in accordance with Table 3. The message rate is 200 Hz, therefore the time between each message is 5 ms.

Col	Data Item	Value / Units
A	Message	Message Number.
B	Time Stamp	Date and Time.
C	Header	0x55AA
D	Message Count	16 Bit, 0 to 65535 decimal, overflowing.
E	Axis X Rate	32 Bit Single Precision FP, (˚/s).
F	Axis X Acceleration	32 Bit Single Precision FP, (g).
G	Axis Y Rate	32 Bit Single Precision FP, (˚/s).
H	Axis Y Acceleration	32 Bit Single Precision FP, (g).
I	Axis Z Rate	32 Bit Single Precision FP, (˚/s).
J	Axis Z Acceleration	32 Bit Single Precision FP, (g).
K	Aux Input Voltage	32 Bit Single Precision FP, (volts).
L	Average IMU Temperature	32 Bit Single Precision FP, (˚C).
M	Axis X Delta Theta	32 Bit Single Precision FP, (˚).
N	Axis X Delta Vel	32 Bit Single Precision FP, (m/s).
O	Axis Y Delta Theta	32 Bit Single Precision FP, (˚).
P	Axis Y Delta Vel	32 Bit Single Precision FP, (m/s).
Q	Axis Z Delta Theta	32 Bit Single Precision FP, (˚).
R	Axis Z Delta Vel	32 Bit Single Precision FP, (m/s).
S	Axis X BIT Data	0 to 65535 decimal.
T	Axis Y BIT Data	0 to 65535 decimal.
U	Axis Z BIT Data	0 to 65535 decimal.
V	Checksum	16 Bit 2's Complement of the 16 Bit Sum of the Previous 0-18 data items.

Table 1: Operational Message Data Output Descriptions

5.4.4.2 Log to memory

This option should be used for short logging sessions where it is useful to view the data on-screen. Logged data can also be saved to disk in CSV format.

The **LoggingMinAvailableMemorySpaceBytes** setting (see Table 2) enables the user to control the remaining memory space limit.

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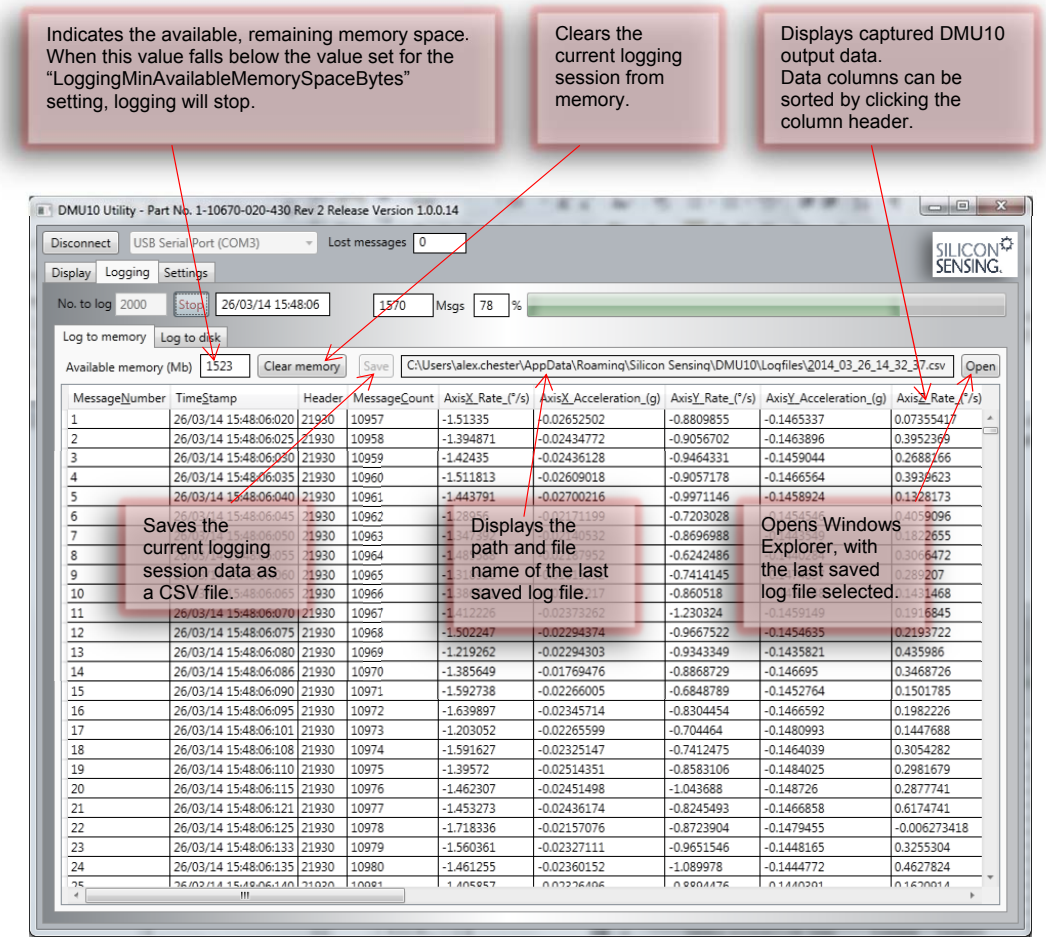
Indicates the available, remaining memory space. When this value falls below the value set for the "LoggingMinAvailableMemorySpaceBytes" setting, logging will stop.
Clears the current logging session from memory.
Displays captured DMU10 output data.
Data columns can be sorted by clicking the column header.
Saves the current logging session data as a CSV file.
Displays the path and file name of the last saved log file.
Opens Windows Explorer, with the last saved log file selected.
DMU10 Utility - Part No. 1-10670-020-430 Rev 2 Release Version 1.0.0.14
Disconnect
USB Serial Port (COM3)
Lost messages
Display
Logging
Settings
No. to log
Stop
Msgs
Log to memory
Log to disk
Available memory (Mb)
Clear memory
Save
Open

Figure 9: Log to memory Tab

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5.4.4.3 Log to Disk

This option should be used for logging large amounts of data.

Log files are created automatically, using a sort friendly date-time file name format.

Year, month, day, hour, minute, second, millisecond

Eg: _2014_03_25_16_40_29.csv

The location that log files are stored in can be set by clicking the log file location display box or by editing the **LoggingLogFileDirectory** setting (section 5.4.5). If the **LoggingLogFileDirectory** setting is left empty, a default location will be used.

The size that a log file is allowed to grow to is set by the **LoggingRecordsPerLogFile** setting (section 5.4.5). When this size is reached, a new log file is created.

The **LoggingMinAvailableDriveSpaceBytes** setting (section 5.4.5) allows the user to control the remaining drive space limit.

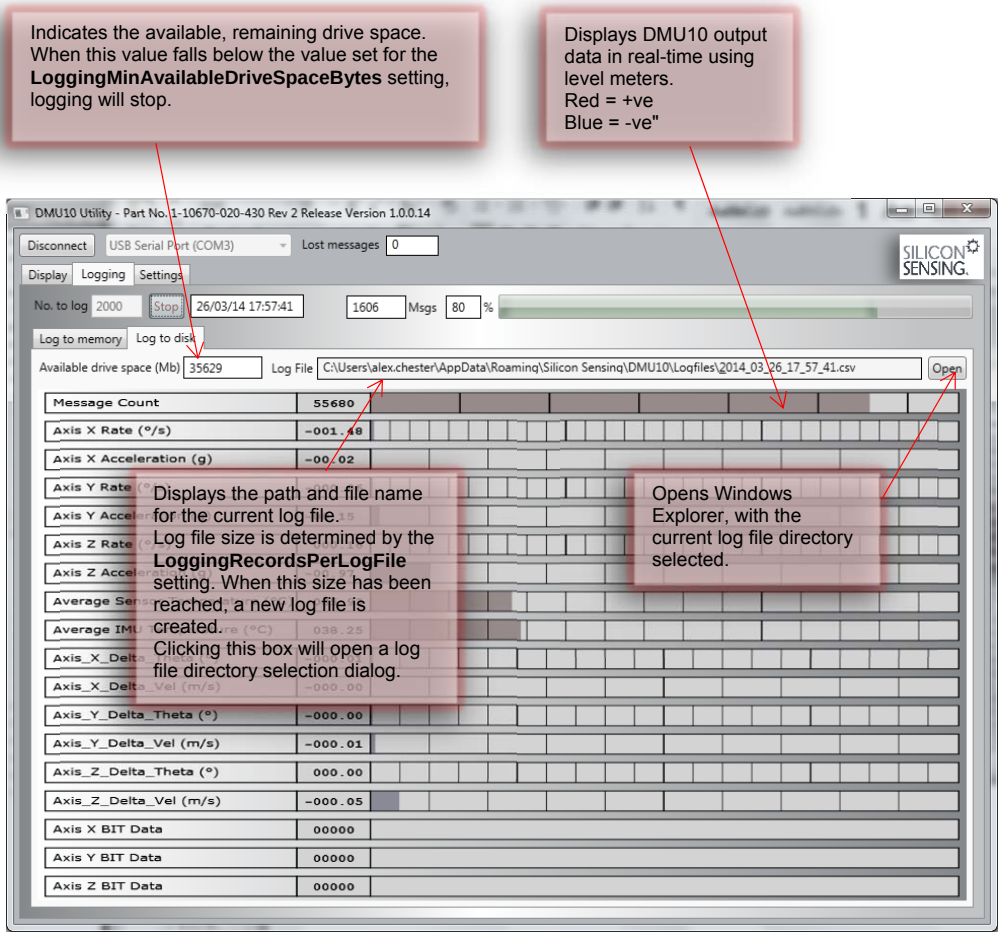
Indicates the available, remaining drive space. When this value falls below the value set for the LoggingMinAvailableDriveSpaceBytes setting, logging will stop.
Displays DMU10 output data in real-time using level meters. Red = +ve Blue = -ve"
DMU10 Utility - Part No. 1-10670-020-430 Rev 2 Release Version 1.0.0.14
Disconnect
USB Serial Port (COM3)
Lost messages
Display
Logging
Settings
No. to log
Stop
26/03/14 17:57:41
1606
Msgs
Log to memory
Log to disk
Available drive space (Mb)
35629
Log File
C:\Users\alex.chester\AppData\Roaming\Silicon Sensing\DMU10\Logfiles\2014_03_26_17_57_41.csv
Open
Message Count
55680
Axis X Rate (°/s)
Axis X Acceleration (g)
Axis Y Rate
Axis Z Rate
Axis_Y_Delta_Theta (°)
Axis_Y_Delta_Vel (m/s)
Axis_Z_Delta_Theta (°)
Axis_Z_Delta_Vel (m/s)
Axis X BIT Data
Axis Y BIT Data
Axis Z BIT Data
Displays the path and file name for the current log file. Log file size is determined by the LoggingRecordsPerLogFile setting. When this size has been reached, a new log file is created. Clicking this box will open a log file directory selection dialog.
Opens Windows Explorer, with the current log file directory selected.

Figure 10: Log to disk Tab

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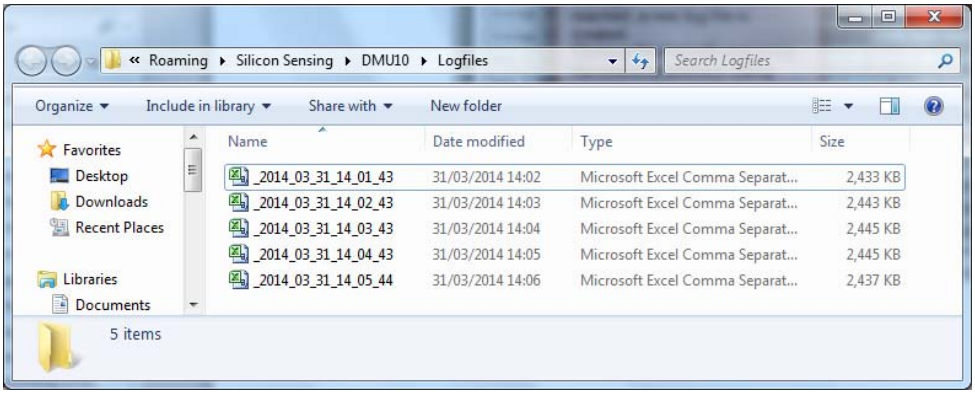

Figure 11: Log files in the default log file directory

5.4.5 Settings Tab

The **Settings** tab displays application user settings for editing. If you require a setting to become permanent (i.e. persist between DMU10 Utility re-starts) click **Save settings**.

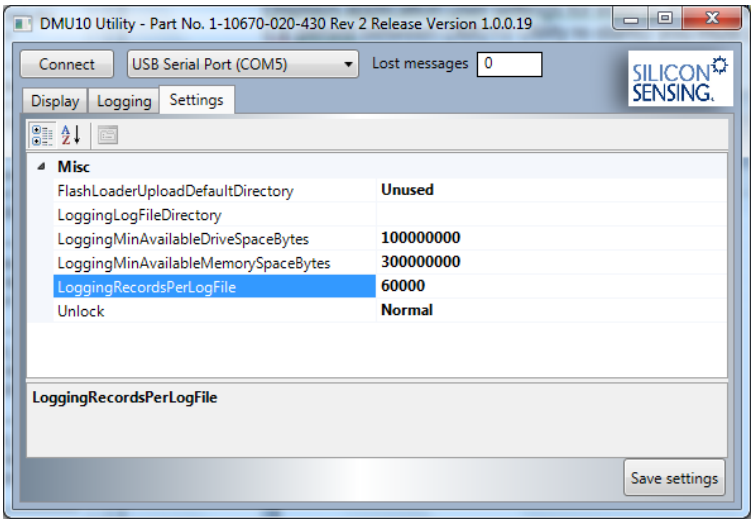

Figure 12: Settings Page

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5.4.5.1 Default Settings

The following default application settings are used.

Setting name and description	Default value
FlashLoaderUploadDefaultDirectory This setting should be left empty	
LoggingLogFileDirectory Overrides the default location for storing log files. This can be edited here or set from the “Log to Disk” page using a selection dialog. Leave this setting empty if you want the default location to be used.	
LoggingMinAvailableDriveSpaceBytes When logging data to disk, logging will stop when the remaining drive space (in bytes) drops to this limit.	100000000
LoggingMinAvailableMemorySpaceBytes When logging data to memory, logging will stop when the remaining memory space (in bytes) drops to this limit.	300000000
LoggingRecordsPerLogFile When the number of records in a log file reaches this limit, a new log file is created. The DMU10 outputs data at 200Hz so the default setting of 60000 will result in a new file every 5 minutes that is approximately 12.5 Mb in size.	60000
Unlock This setting should be left empty.	Empty

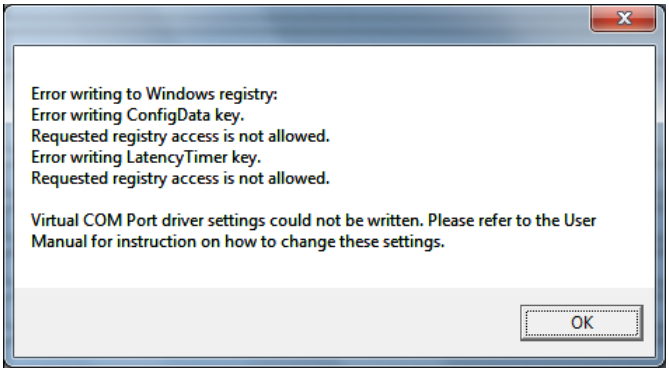
Table 2: Default Settings

5.4.6 Changing the MEV 485i Driver Settings

To perform correctly, the DMU10 utility software requires non-default MEV 485i driver settings.

The software will attempt to change them if it detects that they are incorrect.

If the software cannot change these settings, it will inform the user by displaying a message.


Error writing to Windows registry:
Error writing ConfigData key.
Requested registry access is not allowed.
Error writing LatencyTimer key.
Requested registry access is not allowed.
Virtual COM Port driver settings could not be written. Please refer to the User Manual for instruction on how to change these settings.
OK

If a message like this appears, follow the procedure below to change the settings:

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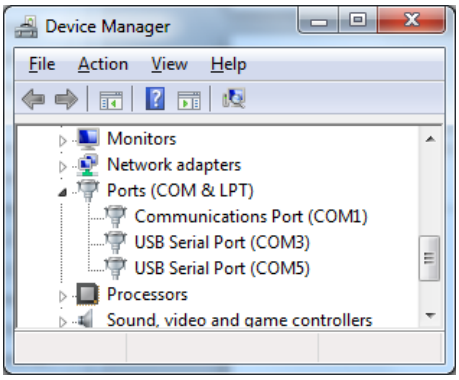
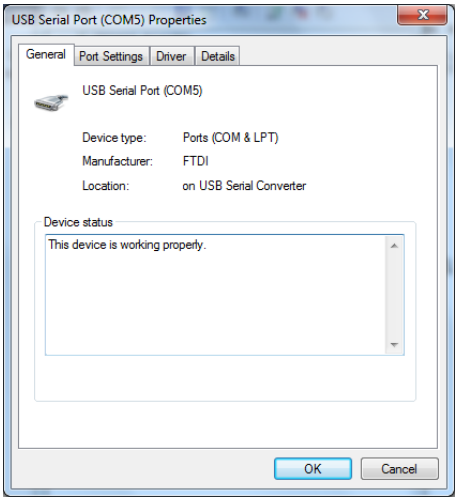
1. Open **Windows Device Manager**. Instructions for doing this vary between operating systems. In Windows 7, this can be accessed using Start / Control Panel / Hardware and Sound / Device Manager.
2. Open **Ports (COM & LPT)**



3. Double click the port that requires changing (the COM port that the DMU10 Utility will connect to)



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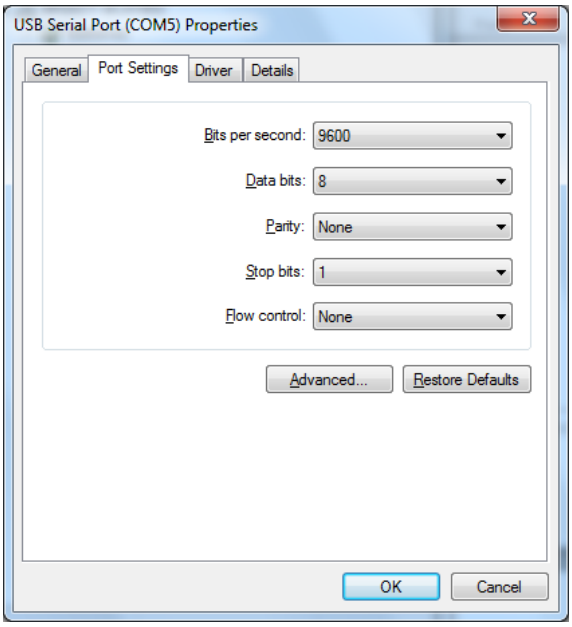
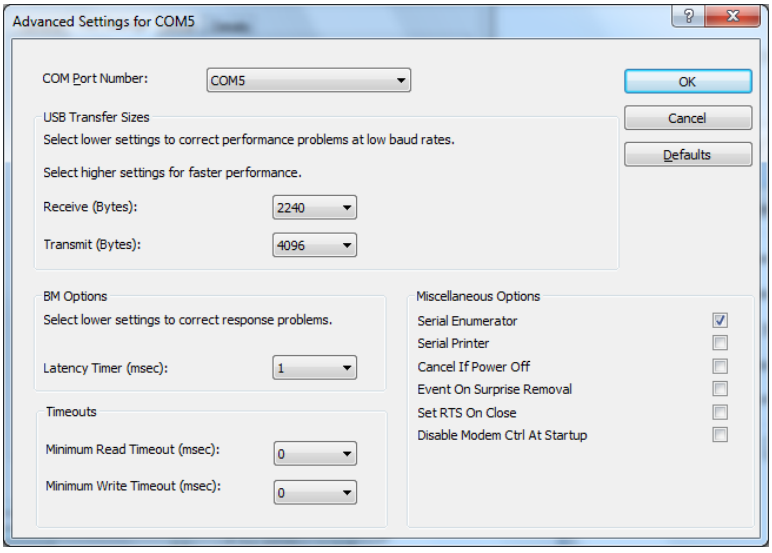
4. Select the **Port Settings** tab.



5. Click **Advanced**. If this results in a message informing you that you do not have write privilages for the registry then you must obtain Administrator rights before continuing with this procedure. Otherwise, change the **Receive (Bytes)** value to 2240 and the **Latency Timer (msec)** value to 1 (as shown below).



6. Click **OK** to save these settings.

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6 Using the DMU10 without the Evaluation Kit

The information in this section is provided to enable the user to use the DMU10 with alternative logging equipment.

Figure 13 shows the internal architecture for DMU10 (A Model).

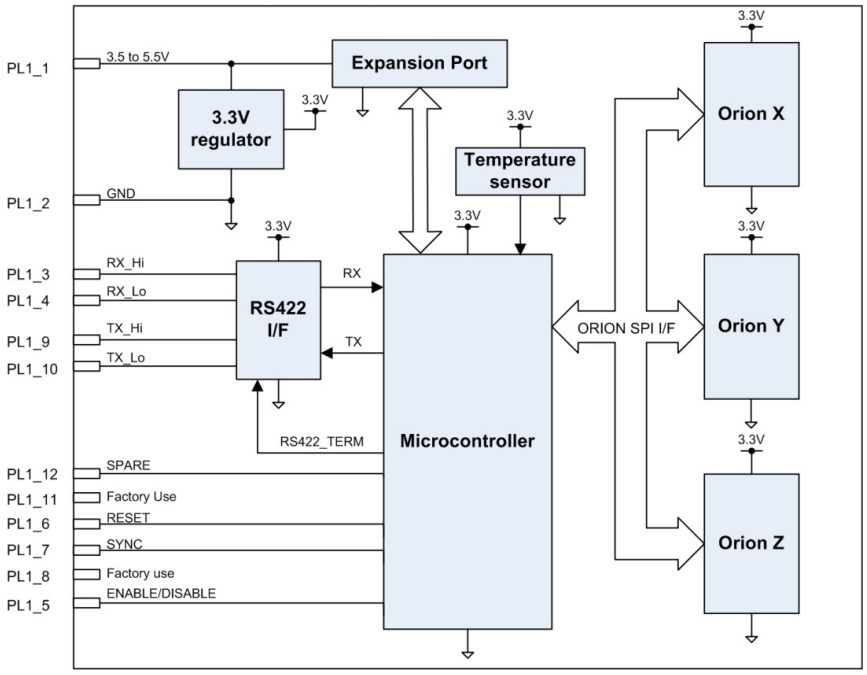

Figure 13: DMU10 Architecture (A Model)

Table 3 shows the connector pin out for DMU10 (A Model).

Note: Pin 1 is the left pin when looking into the connector.

Pin	Signal Name	Signal	In / Out
1	5V	+5 V dc power supply	I
2	GND	Power Supply Ground (0V)	I
3	Rx_Hi+	Serial digital data input - RS-422	I
4	Rx_Lo-	Serial digital data input - RS-422	I
5	Enable/Disable	Serial Stream control.	I
6	RESET	Processor reset (active low).	I
7	Sync Pulse	Pulse at set sampling point (active high).	O
8	Spare	Do not connect to.	N/A
9	Tx_Hi+	Serial digital data output - RS-422	O
10	Tx_Lo-	Serial digital data output - RS-422	O
11	Boot0	Programming control pin	I
12	Spare	Do not connect to.	N/A

Table 3: Connector Pin Out (A Model)

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A typical connection to a host system is shown in Figure 14. Note that some connections are not essential for correct operation.

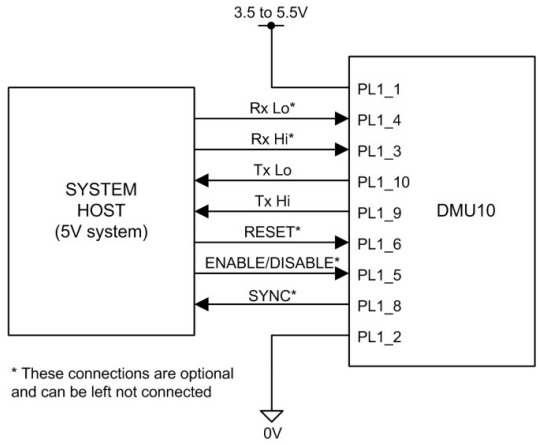

Figure 14: Connection to a Host System

Table 4 describes the format of the data output message for DMU10 (A Model).

Item	Word	Data Item	Value / Units
0	0	Header	16 Bit, 0x55AA
1	1	Message Count	16 Bit, 0 to 65535 decimal.
2	2-3	Axis X Rate	32 Bit Single Precision FP, (˚/s).
3	4-5	Axis X Acceleration	32 Bit Single Precision FP, (g).
4	6-7	Axis Y Rate	32 Bit Single Precision FP, (˚/s).
5	8-9	Axis Y Acceleration	32 Bit Single Precision FP, (g).
6	10-11	Axis Z Rate	32 Bit Single Precision FP, (˚/s).
7	12-13	Axis Z Acceleration	32 Bit Single Precision FP, (g).
8	14-15	Aux Input Voltage	32 Bit Single Precision FP, (volts).
9	16-17	Average IMU Temperature	32 Bit Single Precision FP, (˚C).
10	18-19	Axis X Delta Theta	32 Bit Single Precision FP, (˚).
11	20-21	Axis X Delta Vel	32 Bit Single Precision FP, (m/s).
12	22-23	Axis Y Delta Theta	32 Bit Single Precision FP, (˚).
13	24-25	Axis Y Delta Vel	32 Bit Single Precision FP, (m/s).
14	26-27	Axis Z Delta Theta	32 Bit Single Precision FP, (˚).
15	28-29	Axis Z Delta Vel	32 Bit Single Precision FP, (m/s).
16	30	Axis X BIT Data	16 Bit, 0 to 65535 decimal.
17	31	Axis Y BIT Data	16 Bit, 0 to 65535 decimal.
18	32	Axis Z BIT Data	16 Bit, 0 to 65535 decimal.
19	33	Checksum	16 Bit 2's Complement of the 16 Bit Sum of the Previous 0-18 data items.

Table 4: Operational Message Data Output Descriptions

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6.1 Sensor Sampling and Synchronisation

When the DMU10 Evaluation Kit is not used, it is possible to make use of the ‘Sync Pulse’ output from the DMU10.

The Inertial Sensors within DMU10 are all sampled at 1000 Hz. The ‘Sync Pulse’ on the connector is set HIGH at the start of the sampling and returned to LOW when the last Inertial Sensor is sampled. Pulses are therefore seen on the connector at 1000 Hz.

The Inertial Sensors measurements are then be filtered with a 2nd order low pass filter, also running at 1000 Hz. The factory default setting for this filter is to have a corner frequency of 100 Hz.

The DMU10 message is output at 200 Hz, of every 5th sampling cycle. The sequence is:

- Cycle 1: Sample Sensors, 2nd order Filter.
- Cycle 2: Sample Sensors, 2nd order Filter, Calculate Sensor Compensation.
- Cycle 3: Sample Sensors, 2nd order Filter, Apply Sensor Compensation.
- Cycle 4: Sample Sensors, 2nd order Filter,
- Cycle 5: Sample Sensors, 2nd order Filter, Transmit Message.

The message is transmitted after the ‘Sync Pulse’ associated with Cycle 5 has returned LOW. The Inertial data included in the message is when the ‘Sync Pulse’ associated with Cycle 3 was HIGH. This enables the external equipment to synchronise with the time when the Inertial Data was valid.

The Output Message is output on the RS422 Serial output at 460,800 baud using a non-return to zero protocol. Each message contains a start bit (logic 0), 8 data bits and 2 stop bits (logic 1).

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7 DMU10 Electrical Connections

The interface cable shown in Figure 15 enables the DMU10 to be connected directly to the MEV interface allowing the application to be used immediately.

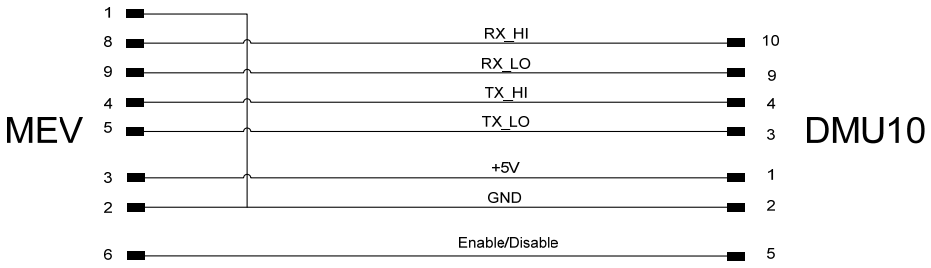

Figure 15: Interface Cable 630486-0900

If the user has a dedicated communication protocol system they wish to use, the blank connector shown in Figure 16 can be used.

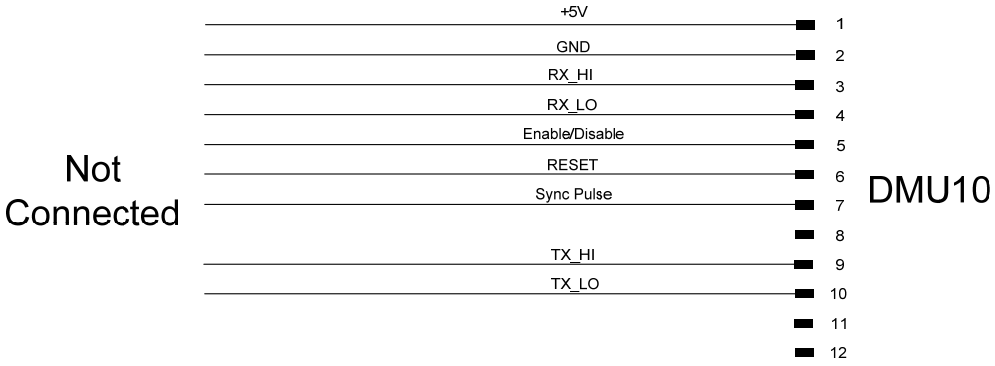

Figure 16: Blank Connector for Customer Use

The blank connector has all the connections pre-crimped to the mating half of the PCB connector, so it can be easily worked into an existing system if required. Figure 17 highlights pin one on the connector.

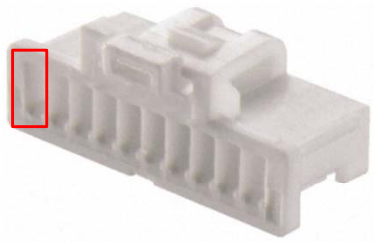

Figure 17: Pin 1 of the blank cable connector

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8 Installation

The installation drawing for DMU10 is shown in Figure 18.

The (unpackaged) DMU10 is an OEM product supplied as a PCB. It is recommended that it is mounted on spacers or pillars using the four mounting holes provided. For the A Model, 2.7 mm holes are used, designed as clearance holes for 2.5 mm screws. The B Model will have the holes located in the same position but will be 2.3 mm diameter holes, designed as clearance holes for 2 mm screws.

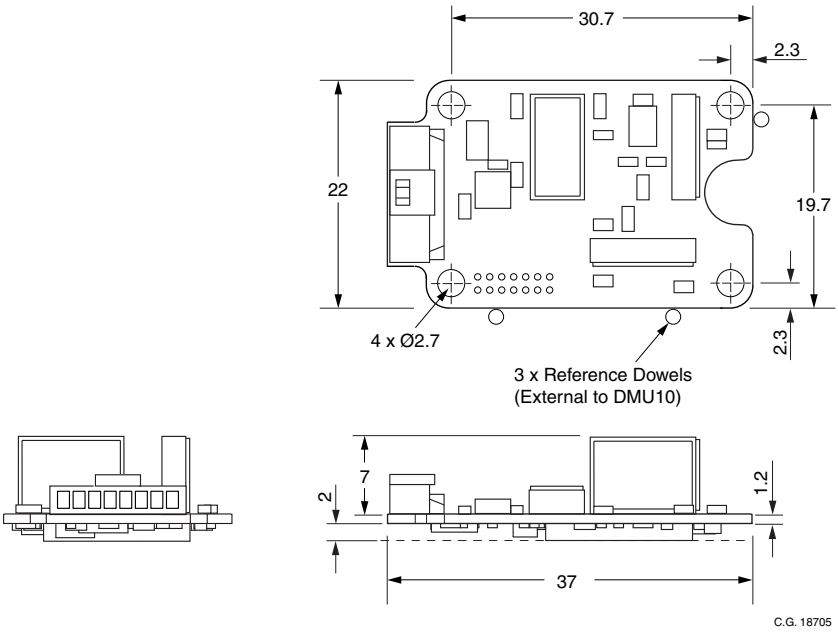

Figure 18: DMU10 (A Model) Installation

During calibration of the DMU10, alignment is achieved using external reference dowels on two edges of the PCB. These two faces therefore form the Datum for alignment purposes.

9 Software Updates

If there has been an update to the software supporting the DMU10 Evaluation Kit, it can be downloaded from the 'Software' section of the download library at:

http://www.siliconsensing.com/information-centre/downloads-library/

10 Contact Details

If you require any additional information about the DMU10 Evaluation Kit or any other products please contact Silicon Sensing via:

Web: www.siliconsensing.com

Email: sales@siliconsensing.com

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Sales Other Countries / Product Management

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Power Supplies

DC-DC Converters
Switching Power Supplies
DC-AC Inverters

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E-Components

Current Sensors
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